

### **REMARKS**

Reconsideration and allowance in view of the foregoing amendments and the following remarks are requested. By this amendment, Applicant has amended claims 1-6 and withdrawn claim 9. Thus, claims 1-7 and 11-14 are pending in the application. No new matter has been added by the amendments. Applicant respectfully requests reconsideration of the Objections and Rejections, which are discussed below.

#### **Claim Objections**

Claims 1-6 and 9 were objected to for containing reference numbers in parentheses. Claims 1-6 have been amended to remove to reference numbers in parentheses. Claim 9 should actually depend from claim 8 however claim 8 has been withdrawn. Accordingly, claim 9 has been withdrawn rendering the claim objection moot.

Claim 1 was objected to for several inconsistencies caused by inadvertent typographical errors. Claim 1 has been amended to recite "a second conductivity type" in place of "a second semiconductor type." Support for this amendment can be found in the present specification at page 3, lines 26-27. Claim 1 has also been amended to recite "a current" rather than "the current."

Claim 6 was objected to for the improperly formatted "AlXGa1\_XP". Claim 6 has been amended to recite " $\text{Al}_x\text{Ga}_{1-x}\text{P}$ ". Claim 6 was also objected to a typographical error with the term "III-V". Claim 6 has been amended to recite "III-V". No new matter was added by these claim amendments.

Applicants respectfully request reconsideration and withdrawal of the claim objections.

**Claim Rejections**

Claims 4-7 and 9 stand rejected under 35 U.S.C. 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The Examiner contends that claim 4 is indefinite because it is unclear what a “lateral extent of the quantum structures” refers to. Claim 4 has been amended to remove “structures” and recite “dots.” Support for this amendment can be found in the present specification at page 5, lines 25-32.

The Examiner contends that claim 5 is indefinite because it is unclear what a “semiconductor regions” refers to. Claim 5 has been amended to explicitly enumerate the regions being referred to as “first semiconductor region, the second semiconductor region and the active semiconductor region.” Support for this amendment can be found in the present specification at page 12, lines 5-9.

The Examiner contends that claim 6 and 7 are indefinite because it is unclear whether each of the semiconductor regions must have the same value for  $x$  in the structure  $\text{Al}_x\text{Ga}_{1-x}\text{P}$ . Claim 6 has been amended to recite that a “the values of  $x$  potentially differing for each of said semiconductor layers.” Support for this amendment can be found in the present specification at page 12, lines 5-9.

The Examiner contends that claim 9 is indefinite because there is insufficient antecedent basis for the term “the pulse direction.” As discussed above, claim 9 should actually depend from claim 8 however claim 8 has been withdrawn. Accordingly, claim 9 has been withdrawn as well.

Claims 1, 5, 9 and 11-14 are rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Okuyama et al. (US Published Patent Application No. 2002/0145148). Claim 9 has been withdrawn rendering the rejection of claim 9 moot. The Examiner contends that Okuyama discloses each and every element of present claims 1, 5, and 9. More specifically, the Examiner contends that Okuyana discloses an active semiconductor region which is arranged between the first semiconductor region and the second semiconductor region, in which quantum structures of a semiconductor material with a direct band gap are embedded in at least two different configurations which are coupled to each other as required by claim 1. Applicant respectfully disagrees with the Examiner's contention for at least the following reasons.

Okuyana describes a light emitting semiconductor device in which an active semiconductor region is located between a p-electrode 22 and an n-electrode 25. (See Okuyana, Fig. 1G). According to paragraph [0062] of Okuyana, the active region may comprise a multi-quantum well structure. On the other hand, claim 1 requires "an active semiconductor region which is arranged between the first semiconductor region and the second semiconductor region, in which quantum structures of a semiconductor material with a direct band gap are embedded in at least two different configurations which are coupled to each other."

The specification of the present application expressly defines quantum structures as "structures which in at least one direction of extent are of a dimension which is so small that the properties of the structure are substantially also determined by quantum-mechanical processes." (Present specification at page 9, lines 11-15). It further defines configurations of quantum structures that can be considered as quantum dots, quantum

wires and quantum wells. (Present specification at page 9, lines 15-18). Claim 1 required “two different configurations” of quantum structures. Okuyama discloses a multi-quantum well structure which is clearly not two different configurations of quantum structures under the definition explicitly set forth in the specification of the present application. A multiple-well quantum structure as disclosed in Okuyama only comprises one configuration of quantum structures, namely quantum wells. Applicant respectfully submits that Okuyama does not and can not anticipate each and every element of present claim 1, and its dependent claims. Moreover, since claims 5 and 11-14 are dependent upon claim 1, either directly or indirectly, Applicant respectfully submits that Okuyama does not and can not anticipate each and every element of present claims 1, 5 and 11-14. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the outstanding 35 U.S.C. 102(b) rejection over Okuyama.

Claims 1, 2, 5, 9 and 11 are rejected under 35 U.S.C. 102(b) as being allegedly anticipated by Shields et al. (US Published Patent Application No. 2003/0127608). Claim 9 has been withdrawn rendering the rejection of claim 9 moot. The Examiner contends that Shields discloses each and every element of present claims 1, 2, 5, 9 and 11. More specifically, the Examiner contends that Shields discloses an “associated switching device for influencing a current flowing through the active semiconductor region, which is so designed as to switch to and fro at least between a current flow through the active semiconductor region with a current intensity below a given threshold current intensity and a current flow through the active semiconductor region with a

current intensity above the threshold current intensity" as required by claim 1. Applicant respectfully disagrees with the Examiner's contention for at least the following reasons.

Shields describes a semiconductor device in which one can cycle between a first voltage level  $V_1$  and a second voltage level  $V_2$ . (Shields, paragraph [0285]). The first voltage level  $V_1$  is chosen such that electrons can be injected through a barrier into the quantum well layer with the quantum dots embedded therein. (Shields, paragraph [0288]). If the device is, on the other hand, switched to the second voltage level  $V_2$ , an injection of electrons into the quantum well layer with the embedded quantum dots is not possible. (Shields, paragraph [0287]). Therefore, when the voltage level  $V_2$  is applied, there is no current flow through the active semiconductor region.

In contrast thereto, the semiconductor device claimed in claim 1 comprises a switching device which is designed such that it is possible to switch to and fro two different current flows through the active semiconductor region. As a consequence, each switching state causes a current to flow through the active region in the inventive device.

Applicant respectfully submits that Shields does not and can not anticipate each and every element of present claim 1, and its dependent claims. Moreover, since claims 2, 5 and 11 are dependent upon claim 1, either directly or indirectly, Applicant respectfully submits that Shields does not and can not anticipate each and every element of present claims 1, 2, 5 and 11. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the outstanding 35 U.S.C. 102(b) rejection over Shields.

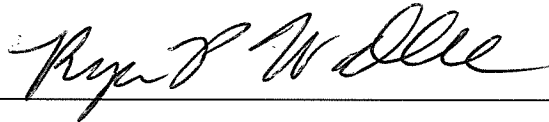
Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Shields. Claims 3 and 4 are indirectly dependent upon claim 1, which is believed to be allowable for the reasons argued above. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the outstanding 35 U.S.C. 103(a) rejection.

Furthermore, a person skilled in the art, namely a physicist specializing in semiconductor physics and experience in the field of light emitting semiconductors, would not combine the teachings of Shields et al. and Okuyama as both teachings cover different materials, namely gallium arsenide and indium arsenide in Shields compared with gallium nitride and indium gallium nitride in Okuyama. Therefore, just replacing the multiple-well quantum structure of Okuyama, which is built up by a certain material combination, with the structure disclosed in Shields, which is built up from a different material combination, would not lead to a working semiconductor device without substantial further considerations.

In view of the foregoing amendments and remarks, Applicants respectfully request withdrawal of the outstanding Office Action rejections. Early and favorable action is awaited. The Director is authorized to charge any fees or overpayment to Deposit Account No. 02-2135.

Respectfully submitted,

By

A handwritten signature in cursive script, appearing to read "Ryan P. Wallace", is written over a horizontal line.

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